

AD _____

Award Number: DAMD17-98-1-8083

TITLE: Breast Cancer Biomarkers Based on Nipple and Fine Needle Aspirates

PRINCIPAL INVESTIGATOR: Michael Torosian, M.D.

CONTRACTING ORGANIZATION: Fox Chase Cancer Center
Philadelphia, Pennsylvania 19111

REPORT DATE: May 2000

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
Distribution Unlimited

The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision unless so designated by other documentation.

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**Personally Identifiable
Information Redacted**

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6. AUTHOR(S) Michael Torosian, M.D.				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Fox Chase Cancer Center Philadelphia, Pennsylvania 19111 E-MAIL: m_torosian@fccc.edu			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
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12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited				12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 Words) Breast cancer is the most common cancer and a leading cause of cancer deaths in women in the United States. The purpose of this project is to identify one or more biomarkers which can be used to identify women at high-risk of developing breast cancer <u>before</u> cancer develops. Prior to undergoing breast surgery, women at increased and normal risk of developing breast cancer will undergo fine needle aspiration (FNA) for determining a series of cytologic, cell cycle and molecular biologic markers of clinical significance for cancer development. These biomarkers include: cytology, DNA index, cell cycle parameters, proliferation index, epidermal growth factor receptor overexpression, p53 and RAS hotspot mutations and hypermethylation of specific gene products (p16, GSTP and E-cadherin). Michael Torosian, M.D. has recently assumed the role of principal investigator of this project and has updated the clinical and scientific aspects of this project. Submission of this project to the IRB at Fox Chase Cancer Center is anticipated within the next 3 months and subject accrual should begin immediately after IRB approval.				
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FOREWORD

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army.

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() Where material from documents designated for limited distribution is quoted, permission has been obtained to use the material.

() Citations of commercial organizations and trade names in this report do not constitute an official Department of the Army endorsement or approval of the products or services of these organizations.

() In conducting research using animals, the investigator(s) adhered to the "Guide for the Care and Use of Laboratory Animals," prepared by the Committee on Care and Use of Laboratory Animals of the Institute of Laboratory Animal Resources, National Research Council (NIH Publication No. 86-23, Revised 1985).

(X) For the protection of human subjects, the investigator(s) have adhered to policies of applicable Federal Law 32 CFR 219 and 45 CFR 46.

() In conducting research utilizing recombinant DNA technology, the investigator(s) adhered to current guidelines promulgated by the National Institutes of Health.

Michael H. Ferguson, MD
Principal Investigator's Signature

5-26-00
Date

Michael H. Torosian, M.D.

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Grant No: DAMD17-98-1-8083

Project Title: Breast Cancer Biomarkers Based on Fine Needle Aspirates

Principle Investigator: Michael H. Torosian, M.D.

Institution: Fox Chase Cancer Center

Performance Period: 1 May 1999 - 30 April 2000

Breast cancer is the most common cancer and a leading cause of cancer deaths in women in the United States. The purpose of this project is to identify one or more biomarkers which can be used to identify women at highest risk of developing breast cancer before cancer develops. Prior to undergoing breast surgery, women at increased and normal risk of developing breast cancer will undergo fine needle aspiration (FNA) for determining a series of cytologic, cell cycle and molecular biologic markers of clinical significance for cancer development.

The specific aims of this study are to:

1. Compare the findings of biomarkers in FNA specimens in women at increased versus normal risk of breast cancer.
2. To determine if FNA specimens are adequate to perform biomarker assays and if this technique could be used in the general outpatient setting.
3. To determine if biomarker levels between high risk and control patients are concordant or discordant and if one or more of the specific biomarkers can distinguish high-risk from control patients. Specifically, the biomarkers will include cellular morphology (cytology), cell cycle analysis (DNA index, cell cycle parameters and proliferation index) and molecular biologic markers (epidermal growth factor receptor overexpression, p53 and RAS hotspot mutations and hypermethylation of specific gene products including p16, GSTP 1 and E-cadherin) of clinical significance for the development of cancer.

At Fox Chase Cancer Center, a combined research team of clinicians and researchers are able to perform these analyses. Samples will be collected on patients who consent to the study and who are undergoing elective breast surgery. Our goal is to study approximately 200 patients over a 3 year period with this technique.

This is an import research project with tremendous clinical implications. All of the biomarkers chosen for testing and analysis have known importance for the development of cancer. Our goal is to identify one or more of these biomarkers which will provide important information regarding breast cancer risk and diagnosis not obtainable with currently available breast cancer screening methods. Michael H. Torosian, M.D. has recently assumed the role of principal investigator of the project and has updated the clinical and scientific aspects of this project. Over the next several months, several important meetings of the co-investigators will occur prior to formal submission of this research application to the IRB at Fox Chase Cancer Center. Once approval is received from the IRB, subject accrual to this important project is expected to occur immediately.

Statement of Work

- Months 1-2: Meet with all Co-Investigators to finalize project
Perform final statistical projections and make final project revisions
- Months 3-4: Submit project proposal to Research Review Committee and IRB at Fox Chase Cancer Center
- Months 5-12 Patients to be accrued to study
FNA specimens to be obtained
Biomarker assays to be performed on an ongoing basis
- a. Cellular morphology (cytology)
 - b. DNA index (ploidy) and cell cycle parameters (% cells in S phase, % cells in G₂M, % hypertetraploid cells)
 - c. Proliferation index
 - d. Epidermal growth factor receptor (EGFR) overexpression
 - e. p53 hot spot mutations
 - f. RAS hot spot mutations
 - g. Hypermethylation of specific gene products
 1. p16
 2. GSTP 1
 3. E-Cadherin
- Months 13-36: Continue to accrue patients to study, obtain FNA specimens and perform biomarker assays.
Perform statistical analysis and prepare results for publication

BREAKDOWN OF PROPOSED COST AND HOURS

15-Jun-00

Period: July 1, 2000 - June 30, 2001

<u>Name</u>	<u>Title</u>	<u>Hourly Rate</u>	<u>Hours</u>	<u>Amount</u>
(A) <u>Direct Labor</u>				
M. Torosian, M.D.	Principal Investigator	\$ 72.46	195.00	\$ 14,130
P. Cairns, Ph.D.	Co-Investigator	42.25	195.00	8,239
L. Giles	Clinical Research Coordinator	24.25	488.00	11,834
				0
				0
				0
				0
				0
			<u>878</u>	<u>34,202</u>
(B) <u>Health Benefits at 32%</u>				<u>10,945</u>
(C) <u>Major Equipment</u>				<u>0</u>
(D) <u>Materials</u>				
Clinical Supplies				1,000
Laboratory Supplies				5,762
				<u>6,762</u>
(E) <u>Subcontracts</u>				<u>0</u>
(F) <u>Travel</u>				
PI to DOD Breast Cancer Meeting (Year 2 only)				0
				<u>0</u>
				<u>0</u>
(G) <u>Publication and Report Costs</u>				<u>0</u>
(H) <u>Consultant</u>				
				<u>0</u>
(I) <u>Other</u>				
Data Management				1,000
Image Analysis				500
Cytology Evaluations				4,500
Statistical Support				500
				<u>0</u>
				<u>6,500</u>
Sub-total direct costs				58,409
(J) Indirect Costs at 73.0% MTDC per HHS agreement date 12/31/97				42,639
TOTAL COSTS				\$ 101,048

BREAKDOWN OF PROPOSED COST AND HOURS

15-Jun-00

Period: July 1, 2001 - June 30, 2002

<u>Name</u>	<u>Title</u>	<u>Hourly Rate</u>	<u>Hours</u>	<u>Amount</u>
(A) <u>Direct Labor</u>				
M. Torosian, M.D.	Principal Investigator	\$ 72.46	195.00	\$ 14,130
P. Cairns, Ph.D.	Co-Investigator	43.51	195.00	8,484
L. Giles	Clinical Research Coordinator	24.97	488.00	12,185
				0
				0
				0
				0
				0
			<u>878</u>	<u>34,800</u>
(B) <u>Health Benefits at 32%</u>				<u>11,136</u>
(C) <u>Major Equipment</u>				<u>0</u>
(D) <u>Materials</u>				
Clinical Supplies				1,030
Laboratory Supplies				6,286
				<u>7,316</u>
(E) <u>Subcontracts</u>				<u>0</u>
(F) <u>Travel</u>				
PI to annual DOD Breast Cancer Meeting				500
				<u>0</u>
				<u>500</u>
(G) <u>Publication and Report Costs</u>				<u>0</u>
(H) <u>Consultant</u>				
				<u>0</u>
(I) <u>Other</u>				
Data Management				1,030
Image Analysis				515
Cytology Evaluations				4,635
Statistical Support				515
				<u>0</u>
				<u>6,695</u>
Sub-total direct costs				60,446
(J) Indirect Costs at 72.0% MTDC per HHS agreement date 12/31/97				43,521
TOTAL COSTS				\$ 103,968

BREAKDOWN OF PROPOSED COST AND HOURS

15-Jun-00

Period: July 1, 2002 - February 28, 2003

<u>Name</u>	<u>Title</u>	<u>Hourly Rate</u>	<u>Hours</u>	<u>Amount</u>
(A) <u>Direct Labor</u>				
M. Torosian, M.D.	Principal Investigator	\$ 72.46	113.00	\$ 8,188
P. Cairns, Ph.D.	Co-Investigator	44.81	113.00	5,064
L. Giles	Clinical Research Coordinator	25.72	300.00	7,716
				0
				0
				0
				0
				0
			<u>526</u>	<u>20,968</u>
(B) <u>Health Benefits at 32%</u>				<u>6,710</u>
(C) <u>Major Equipment</u>				<u>0</u>
(D) <u>Materials</u>				
Clinical Supplies				707
Laboratory Supplies				5,300
				<u>6,007</u>
(E) <u>Subcontracts</u>				<u>0</u>
(F) <u>Travel</u>				
PI to annual DOD Breast Cancer Meeting				0
				<u>0</u>
				<u>0</u>
(G) <u>Publication and Report Costs</u>				<u>0</u>
(H) <u>Consultant</u>				
				<u>0</u>
(I) <u>Other</u>				
Data Management				696
Image Analysis				350
Cytology Evaluations				3,180
Statistical Support				1,400
				<u>0</u>
				<u>5,626</u>
Sub-total direct costs				39,310
(J) Indirect Costs at 68.0% MTDC per HHS agreement date 12/31/97				26,731
TOTAL COSTS				\$ 66,041

Michael H. Torosian, M.D.

Breast Cancer Biomarkers Based on Fine Needle Aspirates

Appendix

A. Curriculum Vitae

MICHAEL H. TOROSIAN, M.D.

CURRICULUM VITAE

Home Address:



Office Address:

Fox Chase Cancer Center
Department of Surgery – C308
7701 Burholme Avenue
Philadelphia, Pennsylvania 19111
Telephone: 215-728-2596
Fax: 215-728-2773

Social Security Number:



Birthdate:



Birthplace:



Child:



Undergraduate Education: Princeton University
Princeton, New Jersey
(1970 - 1974)

Degree: Bachelor of Arts
Major: Biochemical Sciences
Honors: Summa Cum Laude
Phi Beta Kappa
Sigma Xi

Medical Education: University of Pennsylvania School of Medicine
Philadelphia, Pennsylvania
(1974-1978)

Degree: Doctor of Medicine

Medical Licensure: Pennsylvania - MD-024131-E

Postgraduate Training:

- | | |
|-------------|--|
| 1978 - 1979 | Intern in Surgery, Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania |
| 1979 - 1984 | Resident in Surgery, Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania |
| 1984 - 1985 | Chief Resident in Surgery, Hospital of the University of
Pennsylvania, Philadelphia, Pennsylvania |
| 1985 - 1986 | Advanced Fellow in Surgical Oncology, Memorial Sloan-
Kettering Cancer Center, New York, New York |
| 1985 - 1986 | Fellow in Surgery, Cornell University School of Medicine
New York, New York |

Surgical Oncology Fellowships:

- | | |
|-------------|--|
| 1980 - 1981 | Clinical Fellowship, American Cancer Society, Department of Surgery,
Hospital of the University of Pennsylvania |
| 1985 - 1986 | Clinical Fellowship, American Cancer Society, Department of Surgery,
Memorial Sloan-Kettering Cancer Center |
| 1985 - 1986 | Advanced Surgical Oncology Fellowship, Department of Surgery
Memorial Sloan-Kettering Cancer Center |
| 1985 - 1986 | Fellow in Surgery, Cornell University School of Medicine |

Research Fellowships:

- | | |
|-------------|---|
| 1972- | Research Fellowship, National Science Foundation, Department of
Biochemical Sciences, Princeton University |
| 1973 - | Research Fellowship, Department of Biochemical Sciences
Princeton University |
| 1981 - 1983 | Research Fellowship, Harrison Department of Surgical Research,
Department of Surgery, Hospital of the University of Pennsylvania |

1981 - 1983 Research Fellowship, Measey Foundation, Department of Surgery,
Hospital of the University of Pennsylvania

Faculty Appointments:

1979 - 1984 Assistant Instructor of Surgery, University of Pennsylvania
School of Medicine, Philadelphia, Pennsylvania

1984 - 1985 Instructor of Surgery, University of Pennsylvania School of Medicine,
Philadelphia, Pennsylvania

1986 - 1992 Assistant Professor of Surgery, University of Pennsylvania
School of Medicine, Philadelphia, Pennsylvania

1993 -1998 Associate Professor of Surgery, University of Pennsylvania,
School of Medicine, Philadelphia, Pennsylvania

1998- Associate Professor of Surgery, Temple University School of Medicine,
Philadelphia, Pennsylvania

1998- Clinical Director of Breast Surgery Research, Fox Chase Cancer
Center, Philadelphia, Pennsylvania

1999- Program Director, Surgical Oncology Fellowship, Fox Chase Cancer
Center, Philadelphia, Pennsylvania

Hospital Appointments:

1986 - 1998 Attending Surgeon, Division of Surgical Oncology, Department of
Surgery, Hospital of the University of Pennsylvania, Philadelphia,
Pennsylvania

1986 – 1998 Attending Surgeon, Department of Surgery, Veterans
Administration Medical Center, Philadelphia, Pennsylvania

1998- Attending Surgeon, Department of Surgery, American Oncologic
Hospital, Philadelphia, Pennsylvania

Specialty Certification:

1986 American Board of Surgery

1996 American Board of Surgery -- Recertification

Fellowship :

1989 American College of Surgeons

Research Awards:

- | | |
|-------------|--|
| 1983 | Harry M. Vars Research Award, American Society for Parenteral and Enteral Nutrition, Seventh Clinical Congress, Washington, D.C. |
| 1984 | Jonathan E. Rhoads Research Award
First Annual Award, Department of Surgery, University of Pennsylvania School of Medicine |
| 1987 - 1990 | Career Development Award, American Cancer Society, National Division |
| 1988 - 1992 | Pew National Nutrition Program, Faculty Nutrition Fellowship, National Award |

Research Award Mentor: Scott L. Charland - American Society for Parenteral and Enteral Nutrition, 1992, National Award

Teaching Awards:

- | | |
|--------|---|
| 1985 - | Residents' Honor Roll, Excellence in Teaching
University of Pennsylvania School of Medicine |
| 1992 - | Outstanding Teaching Award, Medical School Class of 1992, University of Pennsylvania School of Medicine |

Clinical Distinctions:

- | | |
|-----------|---|
| 1994-1996 | Top Docs in Philadelphia
Philadelphia Magazine |
| 1996-1998 | The Best Doctors in America
1st Edition -- Northeast Region
S.W. Naifeh, Editor
Woodward/White, Inc. |
| 1997 | Guide to Good Health
Top Doctors
Philadelphia Magazine |

Professional Advisory Boards:

- | | |
|--------------|------------------------|
| 1992-present | The Wellness Community |
|--------------|------------------------|

Michael H. Torosian, M.D.
Curriculum Vitae
Page 5

Cancer Patients & Recovery
Philadelphia, PA

1995-1997 Cancer Recovery, Inc.
Disease-Management System
Fort Washington, PA

Professional Society Memberships:

National and International Societies:

- 1974 - Sigma Xi - Scientific Research Society
- 1980 - American College of Surgeons - Candidate Group
- 1982 - American Society for Parenteral and Enteral Nutrition
- 1983 - American Medical Association
- 1985 - Association for Academic Surgery
- 1985 - American Association for the Advancement of Science
- 1986 - New York Academy of Sciences
- 1988 - American Society of Clinical Oncology
- 1988 - American Association for Cancer Research
- 1988 - Radiation Therapy Oncology Group
- 1988 - Eastern Cooperative Oncology Group
- 1989 - American College of Surgeons -- Fellowship
- 1989 - Society of University Surgeons
- 1989 - American Institute of Nutrition
- 1989 - American Federation for Clinical Research
- 1989 - American Society for Clinical Nutrition
- 1990 - Society of Surgical Oncology
- 1991 - Collegium Internationale Chirurgiae Digestivae
- 1991 - Society for Surgery of the Alimentary Tract
- 1991 - Physiological Society of Philadelphia
- 1993 - Surgical Biology Club III/American College of Surgeons
- 1994 - International Society for Nutrition and Cancer
- 1994 - International Association for Surgical Metabolism and Nutrition
- 1994 - Southeastern Surgical Congress
- 1995 - Societe Internationale de Chirurgie
- 1996 - Society for Nutritional Oncology Adjuvant Therapy
- 1997 - Association of American Medical Colleges
- 1999 - American Society of Breast Surgeons

Local Societies:

- 1986 - Ravdin-Rhoads Surgical Society
- 1988 - Pennsylvania Oncologic Society
- 1988 - John Morgan Society
- 1989 - College of Physicians of Philadelphia
- 1995 - Philadelphia Cancer Research Association

Editorial Advisory Board:

1995 - Cancer

Editorial Reviewer: Cancer Research
Cancer
Surgery
Journal of Parenteral and Enteral Nutrition
Critical Reviews in Clinical Laboratory Sciences
Life Sciences
Southern Medical Journal

Committees of National and International Organizations:

1988 - 1990	Education Committee, Association for Academic Surgery
1988 - 1989	Standards Committee, American Society for Parenteral and Enteral Nutrition
1988 -	GI Surgery Subcommittee, Radiation Therapy Oncology Group
1989 - 1990	14th Clinical Congress Planning Committee, Co-Director American Society for Parenteral and Enteral Nutrition
1990 - 1992	Publications Committee, American Society for Parenteral and Enteral Nutrition
1991 -	Committee on Issues and Government Affairs, Society of Surgical Oncology
1991 -	Pennsylvania District #5 Committee on Applicants, American College of Surgeons
1994 -	Research and Data Committee, American Society for Parenteral and Enteral Nutrition
1995 -	Scientific Program Committee, International Association for Surgical Metabolism and Nutrition
1995 -	North American Delegate, Regional Council of Continental Delegates, International Association for Surgical Metabolism and Nutrition
1995 -	Bone and Soft-Tissue Sarcoma Subcommittee, Radiation Therapy Oncology Group
1997 -	Group on Educational Affairs, Association of American Medical Colleges

Committees of the University of Pennsylvania Medical Center:

1984 - 1991	Medical School Annual Giving, Executive Committee Co-Chairman Morgan Shippen Society, University of Pennsylvania School of Medicine
1987 - 1993	Medical Board, Hospital of the University of Pennsylvania

- | | |
|-------------|---|
| 1987 - 1988 | Tumor Registry Committee - Chairman, Hospital of the University of Pennsylvania |
| 1989 - 1991 | Senate Executive Committee and University Council, Elected Member, University of Pennsylvania |
| 1989 - | Medical-Legal Committee, Hospital of the University of Pennsylvania |
| 1990 | Committee to Review the Department of Radiation Oncology, Hospital of the University of Pennsylvania |
| 1993 - | Admissions Committee, University of Pennsylvania School of Medicine |
| 1993 - | Principles of Practice, Executive Committee, University of Pennsylvania Medical Center |
| 1993 - | Clinical Trials Scientific Review and Monitoring Committee, University of Pennsylvania Cancer Center |
| 1993 - | Oncology Strategic Planning Committee, University of Pennsylvania Medical Center |
| 1994 - | Medical Quality Assessment & Improvement Committee
Hospital of the University of Pennsylvania |
| 1994 - | Gastrointestinal Disease Strategic Planning Committee,
Gastrointestinal Oncology Subcommittee |
| 1996 - | National Alumni Council
University of Pennsylvania Medical Center |
| 1997 - 1998 | Reunion Chairman
20th Year Reunion - Medical School Class of 1978
University of Pennsylvania Medical Center |

Research/Academic Grants:

1986 - 1987	American Cancer Society Institutional Research Grant IN-135 Philadelphia, PA "Effect of Parenteral Nutrition on Host/Tumor Metabolism" M. H. Torosian (P.I.) \$7,500.
1987 - 1990	Career Development Award American Cancer Society, National Division M. H. Torosian (Recipient) \$90,000
1987 - 1988	Thomas B. and Jeannette E. Laws McCabe Fund Research Grant Philadelphia, PA "Nutritional and Chemotherapy Related Toxicity" M.H. Torosian (P.I.) \$7,500
1987 - 1989	Clintec Nutrition Company Research Grant #9088E Deerfield, IL "Parenteral Nutrition Can Improve Tumor Response to Chemotherapy" M.H. Torosian (P.I.) \$31,790
1987 - 1991	Merit Review Grant Veterans Administration Medical Center Washington, D.C. "Effect of Nutrition on Tumor Response and Host Toxicity to Chemotherapy" M.H. Torosian (P.I.) \$113,100
1988 - 1992	Pew National Nutrition Program Faculty Nutrition Fellowship, T86-00279-011 Ithaca, NY "Abnormal Carbohydrate and Lipid Substrate Cycling in the Tumor - Bearing Host" M.H. Torosian (Recipient) \$50,000

1988 - 1993	National Cancer Institute Surgical Oncology Research Training Grant #1-T32-CA09619-01 Bethesda, MD M.H. Torosian (Faculty Preceptor) \$525,752
1990 - 1991	Clintec Nutrition Company Research Grant #40668 Deerfield, IL "Lipids and Tumor Growth and Metastasis" M.H. Torosian (P.I.) \$61,735
1992 - 1994	National Institutes of Health/ National Surgical Adjuvant Breast Project Breast Cancer Prevention Trial "Tamoxifen as a Prevention in Women at High Risk for Breast Cancer" M.H. Torosian (P.I.) \$105,000
1993 - 1995	Eleanor Gray Memorial Fund Research Foundation Grant "Treatment of Cancer Cachexia-An Innovative Metabolic Therapy" M.H. Torosian (P.I.) \$12,000
1993 - 1996	National Cancer Institute RO1-CA-58358-01 Bethesda, MD "High - Resolution Magnetic Resonance Imaging of Suspicious Breast Lesions" M.H. Torosian (Co - P.I.) \$1,099,864
1993 - 1998	National Cancer Institute Surgical Oncology Research Training Grant #5 - T32 - CA09619 - 09 Bethesda, MD M.H. Torosian (Faculty Preceptor) \$134,625
1994 - 1997	John Wayne Cancer Institute JWCI Melanoma Multicenter Selective Lymphadenectomy Trial M.H. Torosian (P.I.) \$10,000

1995 - 1996	National Institutes of Health/ National Surgical Adjuvant Breast Project Breast Cancer Prevention Trial "Tamoxifen as a Prevention in Women at High Risk for Breast Cancer" Michael H. Torosian (P.I.) \$25,795
1996 - 1998	American Cancer Society, National Division "Breast Cancer Staging with High Resolution MR Imaging" Michael H. Torosian (Co-Investigator) \$200,000
1997 -	US Army, Department of Defense "Phase I. Trial with TALL -- 104 Cells for the Treatment of Metastatic Breast Cancer" Michael H. Torosian, (Co-Investigator)
1997 - 2000	National Institutes of Health Bethesda, MD "Breast Cancer Patterns of Care and Morbidity" M.H. Torosian (Co-Investigator) \$2,077,782
1997 - 2001	National Institutes of Health Bethesda, MD "A Clinical Study of MRI in Breast Cancer" M.H. Torosian (Co-Investigator) \$5,669,794
1998 - 2003	National Cancer Institute Surgical Oncology Research Training Grant #T32-CA09619 Bethesda, MD M.H. Torosian (Faculty Preceptor) \$788,919
1998-2002	National Institutes of Health Bethesda, MD "Breast Cancer Patterns of Care and Morbidity" M.H. Torosian (Co-Investigator) \$2,077,782

Major Teaching and Clinical Responsibilities at the University of Pennsylvania:

- | | |
|-------------|---|
| 1986 - | Clinical Practice of Surgical Oncology -- 12 Months/Year.
Surgical Residents & Medical Students |
| 1986 - 1991 | Basic Science Lecture Series - Moderator
Surgical Residents & Medical Students |
| 1986 - 1993 | Lecture, Surgery Core Course (Surgery 200) - Bi-Monthly
2nd - 3rd Year Medical Students |
| 1988 - | Basic Science Research Mentor, Elective Work - Study Program
3rd - 4th Year Undergraduate Students |
| 1991 | Surgical Oncology: Advances in Breast & Gastrointestinal Cancers,
Course Co-Director |
| 1991 - | Surgical Oncology Preceptor, Elective Course (Surgery 321) - 11 Month/Year
3rd - 4th Year Medical Students |
| 1993 - | Problem-Based Learning Session, Core Course (Surgery 200) Bi-Monthly
2nd - 3rd Year Medical Students |
| 1996 - | Surgical Oncology Research, Elective Course (Surgery 800),
4th Year Medical Students |

ORIGINAL PAPERS:

1. Levine A, Torosian M, Sarokhan A, Teresky A: Biochemical criteria for the in vitro differentiation of embryoid bodies produced by a transplantable teratoma of mice. The production of acetylcholine esterase and creatine phosphokinase by teratoma cells. *Journal of Cellular Physiology* 84:311-318, 1974.
2. Torosian M, Michelson E, Morganroth J, MacVaugh H: Aspirin and coumadin-related bleeding after coronary artery bypass graft surgery. *Annals of Internal Medicine* 89:325-328, 1978.
3. Michelson E, Morganroth J, Torosian M, MacVaugh H: Relation of preoperative use of aspirin into increased mediastinal blood loss after coronary artery bypass graft surgery. *Journal of Thoracic and Cardiovascular Surgery* 76:694-697, 1978.
4. Michelson E, Torosian M, Morganroth J, MacVaugh H: Early recognition of surgical correctable causes of excessive mediastinal bleeding after coronary artery bypass graft surgery. *American Journal of Surgery* 139:313-317, 1980.
5. Torosian M and Rombeau J: Feeding by tube enterostomy: A collective review. *Surgery, Gynecology and Obstetrics* 150:918-927, 1980
6. Torosian M, Buzby GP, Mullen JL: Why nutritional support? *Contemporary Surgery* 18:66-74, 1981.
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